# posirot®
# Magnetic Angle Sensors

## PRDS6

Angle sensor for heavy duty applications



- **Measurement range 0°... 360°**
- **Protection class IP67/IP69**
- **Hermetically sealed stainless steel housing**
- **Longitudinal water barrier; potted electronics**
- **Contactless with external position magnet, wear-free**

## Product versions

**Incremental output**

**Digital output SSI**

**Digital output CANopen/SAE J1939 (optional redundant)**



PRDS6 - Magnetic Angle Sensor

## Version with Incremental output

### Specifications

| | | | Order options |
|---|---|---|---|
| **Mechanical connection** | Contactless with external position magnet | 1 | **K** |
| **Measurement range** | 0 ... 360° | | |
| **Resolution** | 1, 2, 3 ... 1024 pulses per revolution | 2 | **1, 2, 3 ... 1024** |
| **Linearity** | ±1% (typical) | | |
| **Output** | Incremental encoder output RS422 compatible output with excitation 5 V DC<br>Incremental encoder output RS422 compatible output with excitation 8 ... 36 V DC<br>Incremental encoder output HTL compatible output with excitation 8 ... 36 V DC DC | 3 | **RS5VF**<br>**RS24VF**<br>**HT24VF** |
| **Rated distance sensor / magnet** | Depending on the position magnet | | |
| **Connection** | 8-pin connector M12, axial<br>8-pin connector M12, radial<br>Cable, standard length 2 m<br>Deutsch connector, not shielded | 4 | **M12A8**<br>**M12R8**<br>**KAB2M** |
| **Housing material** | Stainless steel EN 1.4404 (AISI 316L) | 5 | **VA** |
| **Mounting** | Screws M6 | | |
| **Protection class** | IP67/IP69 | | |
| **Shock** | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks | | |
| **Vibration** | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles | | |
| **Temperature range** | -40 ... +85°C | | |
| **Weight** | 390 g approx. (without cable) | | |
| **EMC** | DIN EN 61326-1:2013 | | |

### Order code

PRDS6 – 1 – 2 – 3 – 4 – 5

**Order example:** PRDS6 – K – 1024 – RS24VF – M12A8 – VA

**Accessories:**

**Connector cable (see page 23)**

**Position magnets (see from page 8)**

SSI



PRDS6 - Magnetic Angle Sensor

## Version with Digital output SSI

### Specifications

| | | | Order options |
|---|---|---|---|
| **Mechanical connection** | Contactless with external position magnet | 1 | **K** |
| **Measurement range** | 0 ... 360° | | |
| **Output** | Synchronous serial output with excitation 5 V DC<br>Synchronous serial output with excitation 10 ... 36 V | 2 | **RSSI5V**<br>**RSSI24V** |
| **Code characteristics** | Signal increasing CW, clockwise<br>Signal increasing CCW, counterclockwise | 3 | **CW**<br>**CCW** |
| **Resolution** | 12 Bit (4096 steps) per revolution | | |
| **Repeatability** | ±0.1° (typical) | | |
| **Linearity** | ±1% (typical) | | |
| **Rated distance sensor / magnet** | Depending on the position magnet | | |
| **Connection** | 8-pin connector M12, axial<br>8-pin connector M12, radial<br>Cable, standard length 2 m<br>Deutsch connector, not shielded | 4 | **M12A8**<br>**M12R8**<br>**KAB2M** |
| **Housing material** | Stainless steel EN 1.4404 (AISI 316L) | 5 | **VA** |
| **Mounting** | Screws M6 | | |
| **Protection class** | IP67/IP69 | | |
| **Shock** | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks | | |
| **Vibration** | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles | | |
| **Temperature range** | -40 ... +85°C | | |
| **Weight** | 390 g approx. (without cable) | | |
| **EMC** | DIN EN 61326-1:2013 | | |

### Order code

PRDS6 – 1 – 2 – 3 – 4 – 5

**Order example:** PRDS6 – K – RSSI5V – CW – M12A8 – VA

**Accessories:**

**Connector cable (see page 23)**

**Position magnets (see from page 8)**



PRDS6 - Magnetic Angle Sensor

## Version with Digital output CANopen/SAE J1939 (optional redundant)

### Specifications

| | | | Order options |
|---|---|---|---|
| **Mechanical connection** | Contactless with external position magnet | 1 | **K** |
| **Measurement range** | 0 ... 360° | | |
| **Output** | CANopen<br>CAN SAE J1939<br>CANopen, redundant<br>CAN SAE J1939, redundant | 2 | **CANOP**<br>**CANJ1939**<br>**CANOPR**<br>**CANJ1939R** |
| **Resolution** | 0.05° max. | | |
| **Linearity** | ±1% (typical) | | |
| **Rated distance sensor / magnet** | Depending on the position magnet | | |
| **Connection** | 5-pin connector M12 axial<br>5-pin connector M12 radial<br>Deutsch connector, not shielded | 3 | **M12A5/CAN**<br>**M12R5/CAN** |
| **Housing material** | Stainless steel EN 1.4404 (AISI 316L) | 4 | **VA** |
| **Mounting** | Screws M6 | | |
| **Protection class** | IP67/IP69 | | |
| **Shock** | DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks | | |
| **Vibration** | DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles | | |
| **Temperature range** | -40 ... +85°C | | |
| **Weight** | 390 g approx. (without cable) | | |
| **EMC** | DIN EN 61326-1:2013 | | |

### Order code

PRDS6 – 1 – 2 – 3 – 4

**Order example:** PRDS6 – K – CANOP – M12A5/CAN – VA

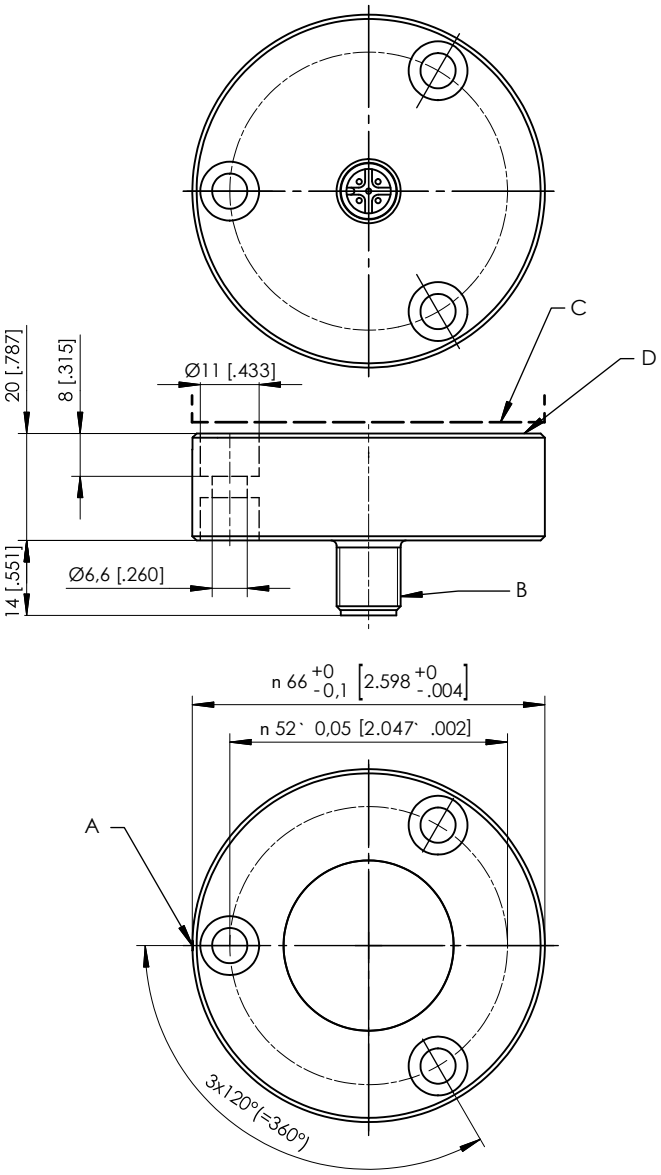
**Accessories:**

**Connector cable (see page 24)**

**Position magnets (see from page 8)**

## Dimensions

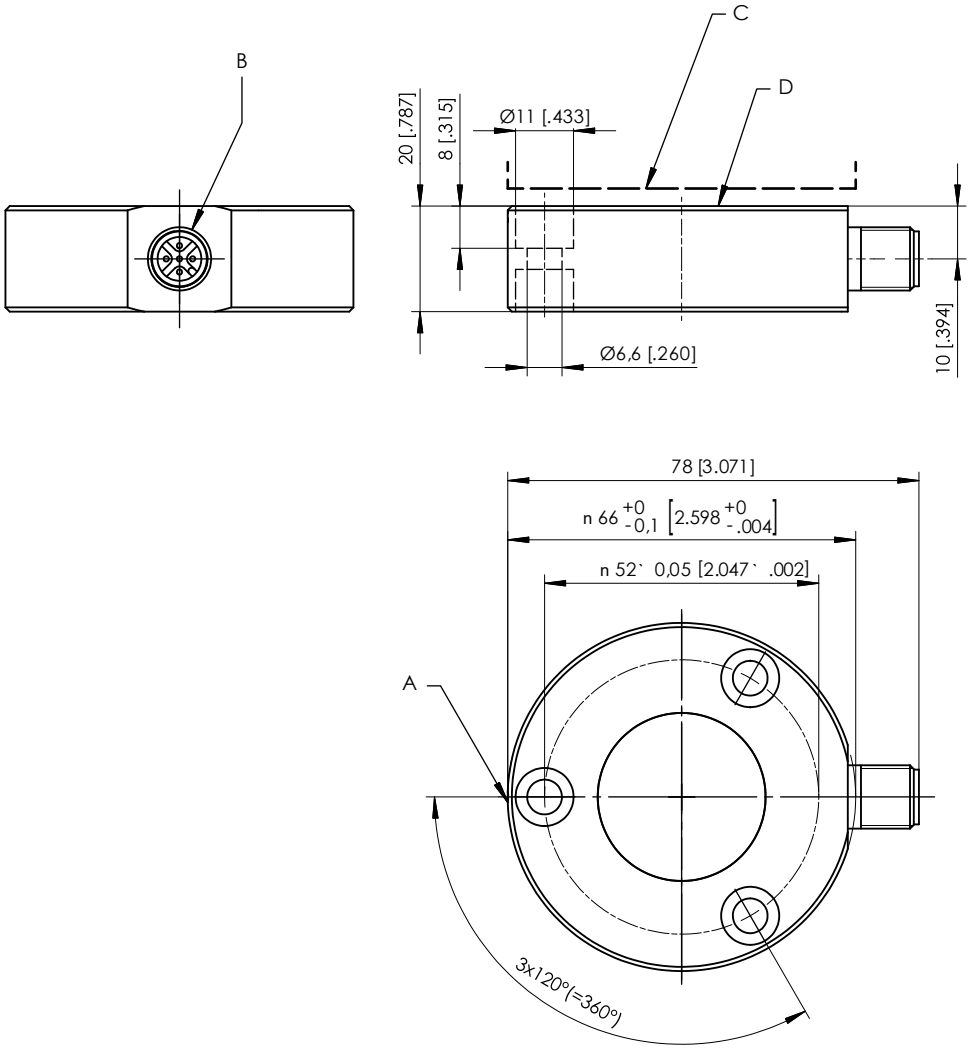
### Connector M12, axial




A – Marking
B – Connector M12
C – Position magnet
D – Measurement area

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

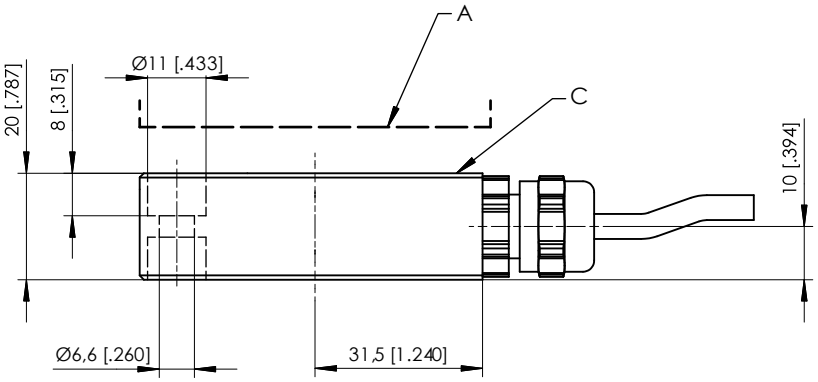
## Connector M12, radial

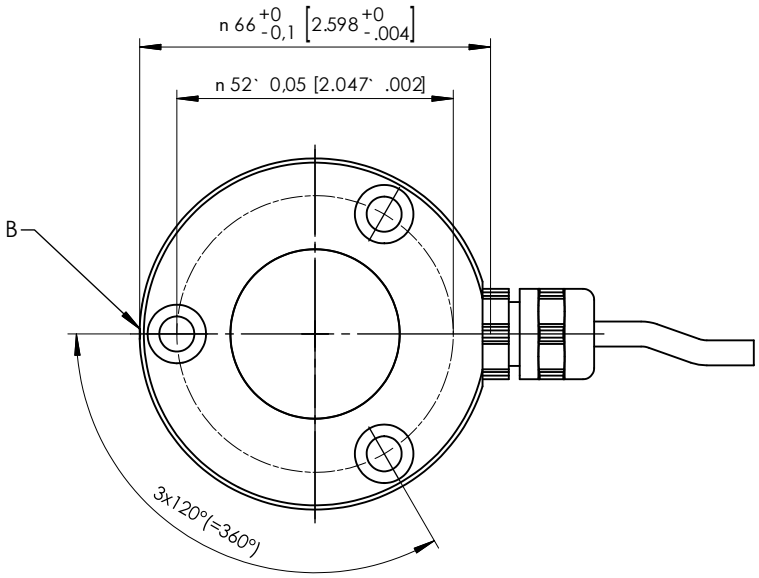



A – Marking
B – Connector M12
C – Position magnet
D – Measurement area

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

## Cable version



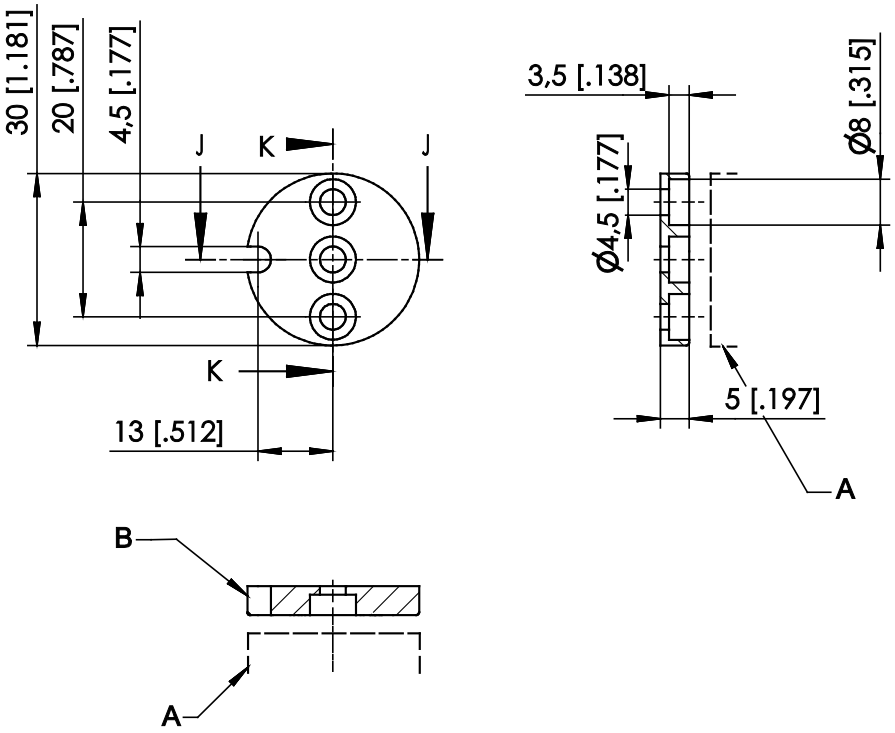




A – Position magnet
B – Marking
C – Measurement area

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

## Position magnets

### PRMAG20



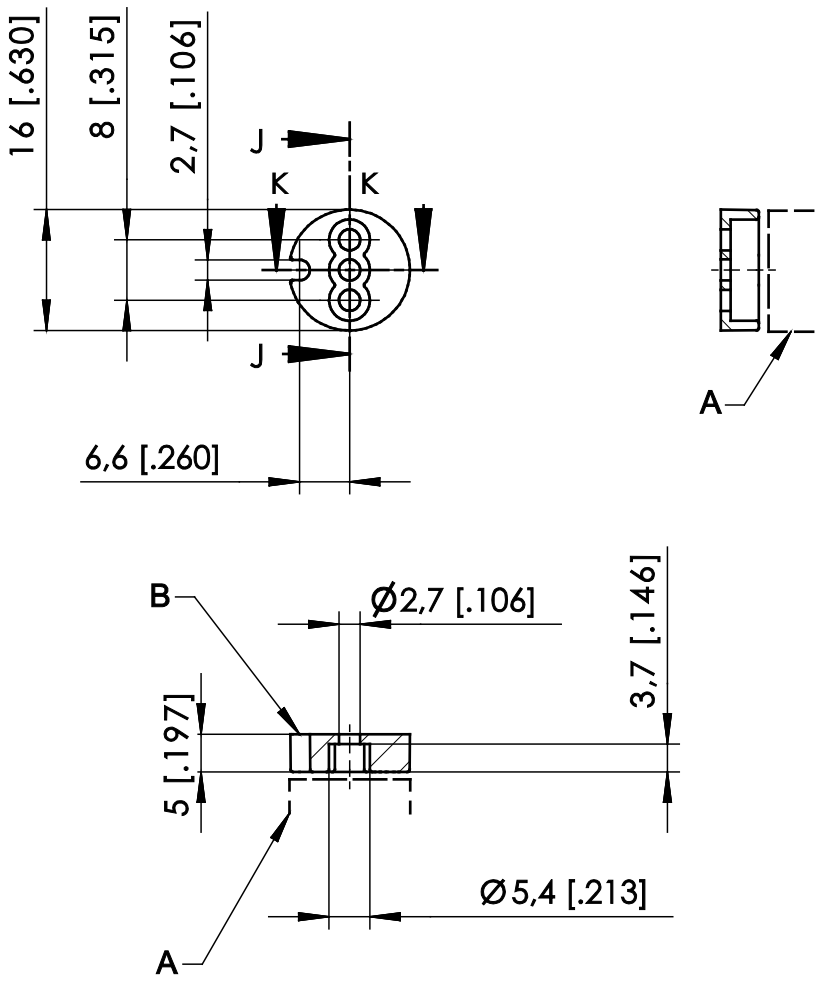

A – Sensor
B – Marking

| Order code | Weight | Material | Moment of inertia |
|---|---|---|---|
| **PRMAG20** | approx. 12 g | zinc coated steel, plastic | 1.3 kgmm$^2$ |

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

**PRMAG21**



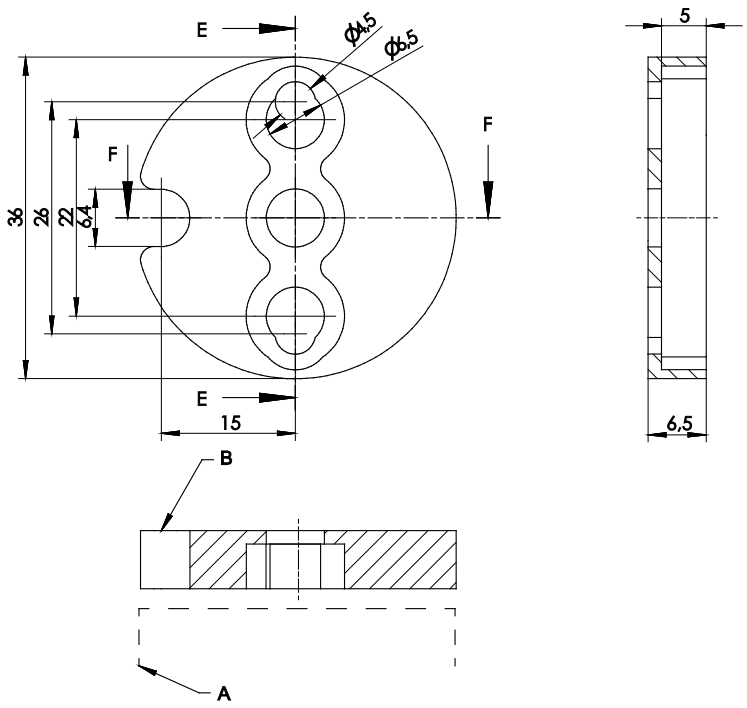

A – Sensor
B – Marking

| Order code | Weight | Material | Moment of inertia |
|---|---|---|---|
| **PRMAG21** | approx. 3 g | zinc coated steel; plastic | 0.1 kgmm$^2$ |

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch]
Dimensions informative only.
For guaranteed dimensions please consult factory.

## PRMAG22



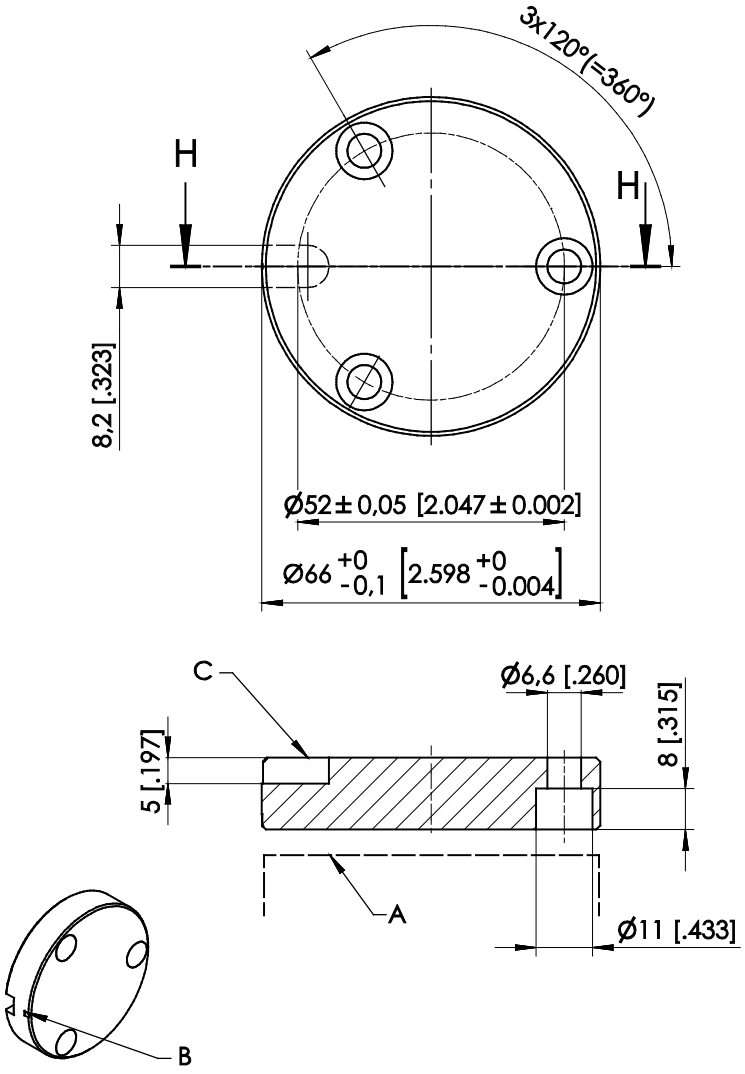

A – Sensor
B – Marking

| Order code | Weight | Material | Moment of inertia |
|---|---|---|---|
| **PRMAG22** | approx. 19 g | zinc coated steel, plastic | 3 kgmm$^2$ |

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only
For guaranteed dimensions please consult factory.

## PRMAG6-Z / PRMAG6-Z-VA



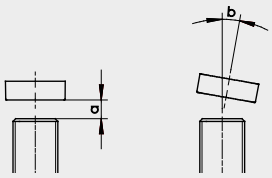

A – Sensor
B – Marking
C – Notch

| Order code | Weight | Material | Moment of inertia |
|---|---|---|---|
| **PRMAG6-Z** | approx. 110 g | AlMgSi1, | 65 kgmm$^2$ |
| **PRMAG6-Z-VA** | approx. 315 g | stainless steel<br>EN 1.4404 (AISI 316L) | 190 kgmm$^2$ |

A misalignment of the position magnet has an effect on the linearity.

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions please consult factory.

### Measuring error by misalignment of the position magnet




Air gap (a)
Parallelism (b)
Lateral offset (c)

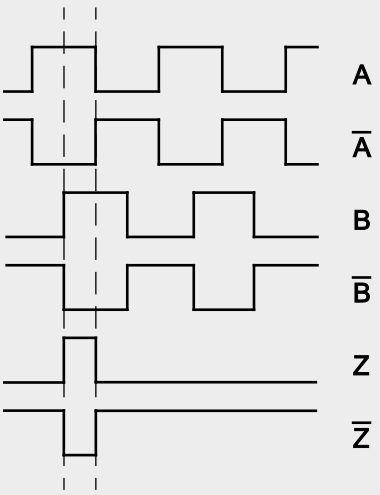
| Sensor | Position magnet | Air gap [mm] | Parallelism [°] | Error by lateral offset [°] | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 0.2 mm | 0.5 mm | 1 mm | 2 mm | 3 mm | 4 mm |
| PRAS6<br>PRDS6 | PRMAG20 | 0 ... 5.5 | 0 ... 5 | 0.15 | 0.4 | 0.8 | 2.2 | 5 | – |
| | PRMAG21 | 0 ... 3 | 0 ... 5 | 0.2 | 0.4 | 1 | 3.8 | 10 | – |
| | PRMAG22 | 0 ... 8.5 | 0 ... 5 | 0.1 | 0.4 | 1 | 2.2 | 4.5 | 8 |
| | PRMAG6-Z-(VA) | 0 ... 7.5 | 0 ... 5 | 0.1 | 0.2 | 0.6 | 1.5 | 4.5 | 8.5 |

## Output specification

### Incremental output

| | | |
|---|---|---|
| **RS5VF /RS24VF**<br>Incremental | Interface | EIA RS-422 |
| | Excitation voltage | RS5VF: 5 V DC ±10 %<br>RS24VF: 8 ... 36 V DC |
| | Excitation current | 100 mA max., depending on the load |
| | Max. pulse frequency | 500 kHz |
| | Output signals | A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ Push-Pull |
| | Output current | 10 mA max. |
| | Stability (temperature) | ±50 x $10^{-6}$ / °C f.s. (typical) |
| | Operating temperature | -40 ... +85 °C |
| | Protection | Short circuit |
| | EMC | DIN EN 61326-1:2013 |

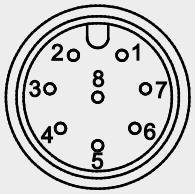
**Output signals**




Pulse sequence for clockwise rotation CW in view of shaft or active front of sensor.

A zero impulse Z, $\overline{Z}$ is generated at the reference position.

**Signal wiring**
**Connector M12, 8 pin**

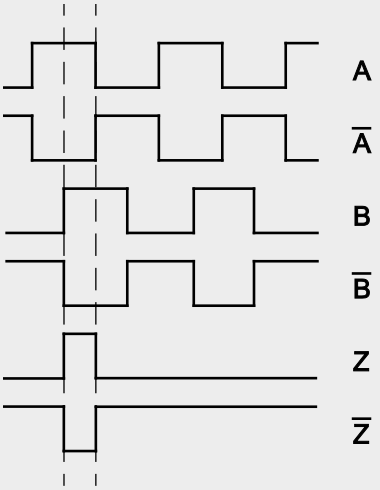



View to the sensor connector

| Output signals | Connector pin no. | Cable color |
|---|---|---|
| Excitation + | 1 | white |
| Excitation GND | 2 | brown |
| A | 4 | yellow |
| $\overline{A}$ | 6 | pink |
| B | 3 | green |
| $\overline{B}$ | 5 | grey |
| Z | 7 | blue |
| $\overline{Z}$ | 8 | red |

| | | |
|---|---|---|
| **HT24VF**<br>Incremental | Interface | HTL |
| | Excitation voltage | 8 ... 36 V DC |
| | Excitation current | 100 mA max., depending on the load |
| | Max. pulse frequency | 500 kHz |
| | Output signals | A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$ Push-Pull |
| | Output current | 10 mA max. |
| | Stability (temperature) | ±50 x $10^{-6}$ / °C f.s. (typical) |
| | Operating temperature | -40 ... +85 °C |
| | Protection | Short circuit |
| | EMC | DIN EN 61326-1:2013 |

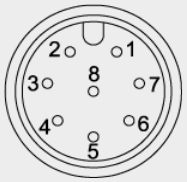
## Output signals




Pulse sequence for clockwise rotation CW in view of shaft or active front of sensor.

A zero impulse Z, $\overline{Z}$ is generated at the reference position.

## Signal wiring Connector M12, 8 pin



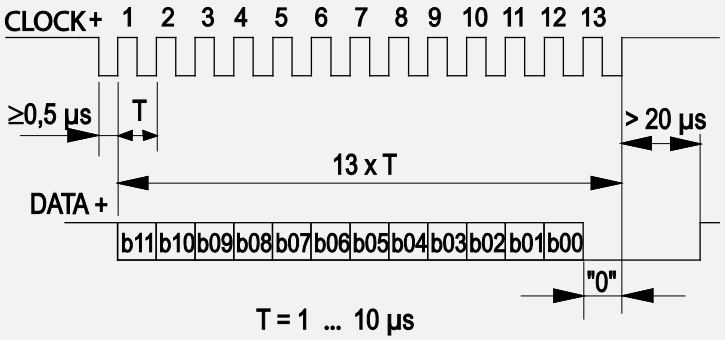

View to the sensor connector

| Output signals | Connector pin no. | Cable color |
|---|---|---|
| Excitation + | 1 | white |
| Excitation GND | 2 | brown |
| A | 4 | yellow |
| $\overline{A}$ | 6 | pink |
| B | 3 | green |
| $\overline{B}$ | 5 | grey |
| Z | 7 | blue |
| $\overline{Z}$ | 8 | red |

## SSI output

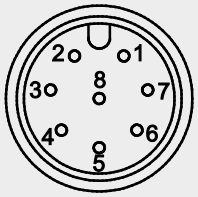
| | | |
|---|---|---|
| **RSSI5V/RSSI24V**<br>Synchronous serial SSI<br>SSI | Interface | EIA RS-422 |
| | Excitation voltage | RSSI5V: 5 V DC ±10%<br>RSSI24V: 10 ... 36 V DC |
| | Excitation current | 100 mA max. without load |
| | Clock frequency | 100 kHz ... 500 kHz |
| | Code | Gray-Code, continuous progression, 12 bit |
| | Delay between pulse trains | 20 µs min. |
| | Stability (temperature) | ±50 x $10^{-6}$ / °C f.s. (typical) |
| | Operating temperature | Refer to sensor specifications |
| | Protection | Short circuit |
| | EMC | EN 61326-1:2013 |

**Data format**
(Train of 13 pulses)




| Transmission rate | Cable length | Baud rate | Note: |
|---|---|---|---|
| | 50 m | 100 - 1000 kHz | Extension of the cable length will reduce the maximum transmission rate. The signals CLOCK /$\overline{\text{CLOCK}}$ and DATA/$\overline{\text{DATA}}$ must be connected in a twisted pair cable, shielded in pairs, the pairs also commonly shielded. |
| | 100 m | 100 - 300 kHz | |

**Signal wiring**
**Connector M12, 8 pin**




View to the sensor connector

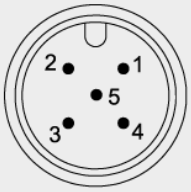
| Output signals | Connector pin no. | Cable color |
|---|---|---|
| Excitation + | 1 | white |
| Excitation GND | 2 | brown |
| CLOCK | 3 | green |
| $\overline{\text{CLOCK}}$ | 4 | yellow |
| DATA | 5 | grey |
| $\overline{\text{DATA}}$ | 6 | pink |
| - | 7 | blue |
| - | 8 | red |

## Digital output CANopen

| | | |
|---|---|---|
| **CANOP**<br>CANopen<br>CAN | CAN Specification | ISO 11898, Basic and Full CAN 2.0 B |
| | Communication profile | CANopen CiA 301 V 4.02, Slave |
| | Device profile | Encoder CiA 406 V 3.2 |
| | Configuration services | Layer Setting Service (LSS), CiA Draft Standard 305 (transmission rate, node id) |
| | Error Control | Node Guarding, Heartbeat, Emergency Message |
| | Node ID | Default: 127; programmable via LSS or SDO |
| | PDO | 3 TxPDO, 0 RxPDO, static mapping |
| | PDO Modes | Event-/Time triggered, Remote-request, Sync cyclic/acyclic |
| | SDO | 1 server, 0 Client |
| | CAM | 8 cams |
| | Certified | Yes |
| | Transmission rates | 50 kBaud to 1 MBaud, default: 125 kBaud; programmable via LSS or SDO |
| | Bus connection | M12 connector, 5 pin |
| | Integrated bus terminating resistor | Adjustable by the customer |
| | Bus, galvanic isolated | No |

| | | |
|---|---|---|
| **Specifications** | Excitation voltage | 8 ... 36 V DC |
| | Excitation current | 20 mA typical at 24 V DC<br>40 mA typical at 12 V DC, 80 mA max. |
| | Resolution | 0.05° max. |
| | Stability (temperature) | ±50 x $10^{-6}$/°C f.s. (typical) |
| | Repeatability | 1 LSB |
| | Operating temperature | See specification of the respective sensor |
| | Protection | Reverse polarity, short circuit |
| | Dielectric strength | 1 kV (V AC, 50 Hz, 1 min.) |
| | EMC | DIN EN 61326-1:2013 |

**Signal wiring**
**Connector M12, 5 pin**



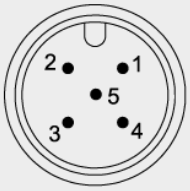

View to the sensor connector

| Output signals | Connector pin no. | Cable color |
|---|---|---|
| Shield | 1 | brown |
| Excitation + | 2 | white |
| GND | 3 | blue |
| CAN-H | 4 | black |
| CAN-L | 5 | grey |

| | | |
|---|---|---|
| **CANOPR**<br>CANopen | CAN Specification | ISO 11898, Basic and Full CAN 2.0 B |
| | Communication profile | CANopen CiA 301 V 4.02, Slave |
| | Device profile | Encoder CiA 406 V 3.2 |
| | Configuration services | Layer Setting Service (LSS), CiA Draft Standard 305 (transmission rate, node id) |
| | Error Control | Node Guarding, Heartbeat, Emergency Message |
| | Node ID | Default: 127 and 126; programmable via LSS or SDO |
| | PDO | 3 TxPDO, 0 RxPDO, static mapping |
| | PDO Modes | Event-/Time triggered, Remote-request, Sync cyclic/acyclic |
| | SDO | 1 server, 0 Client |
| | CAM | 8 cams |
| | Certified | Yes |
| | Transmission rates | 50 kBaud to 1 MBaud, default: 125 kBaud; programmable via LSS or SDO |
| | Bus connection | M12 connector, 5 pin |
| | Integrated bus terminating resistor | adjustable by the customer |
| | Bus, galvanic isolated | No |

| | | |
|---|---|---|
| **Specifications** | Excitation voltage | 8 ... 36 V DC |
| | Excitation current | 40 mA typical at 24 V DC<br>80 mA typical at 12 V DC, 120 mA max. |
| | Measuring rate | 1 kHz (asynchronous) |
| | Stability (temperature) | ±50 x $10^{-6}$/°C f.s. (typical) |
| | Repeatability | 1 LSB |
| | Operating temperature | See specification of the respective sensor |
| | Protection | Reverse polarity, short circuit |
| | Dielectric strength | 1 kV (V AC, 50 Hz, 1 min.) |
| | EMC | DIN EN 61326-1:2013 |

**Signal wiring**
**Connector M12, 5 pin**




View to the sensor connector

| Output signals | Connector pin no. | Cable color |
|---|---|---|
| Shield | 1 | brown |
| Excitation + | 2 | white |
| GND | 3 | blue |
| CAN-H | 4 | black |
| CAN-L | 5 | grey |

## Digital output CAN SAE J1939

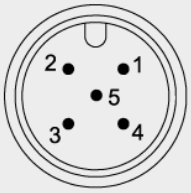
| | | | |
|---|---|---|---|
| **CANJ1939**<br>SAE J1939<br>CAN | CAN Specification | ISO 11898, Basic and Full CAN 2.0 B | |
| | Transceiver | 24V-compliant, not isolated | |
| | Communication profile | SAE J1939 | |
| | Baud Rate | 250 kbit/s | |
| | Internal termination resistor | adjustable by the customer | |
| | Address | Default 247d, configurable | |

| | | | |
|---|---|---|---|
| **NAME Fields** | Arbitrary address capable | 1 | Yes |
| | Industry group | 0 | Global |
| | Vehicle system | 7Fh (127d) | Non specific |
| | Vehicle system instance | 0 | |
| | Function | FFh (255d) | Non specific |
| | Function instance | 0 | |
| | ECU instance | 0 | |
| | Manufacturer | 145h (325d) | Manufacturer ID |
| | Identity number | 0nnn | Serial number 21 bit |

| | | | |
|---|---|---|---|
| **Parameter Group Numbers (PGN)** | Configuration data | PGN EF00h | Proprietary-A<br>(PDU1 peer-to-peer) |
| | Process data | PGN FFnnh | Proprietary-B<br>(PDU2 broadcast);<br>nn Group Extension (PS) configurable |

| | | |
|---|---|---|
| **Specifications** | Excitation voltage | 8 ... 36 V DC |
| | Excitation current | 20 mA typical at 24 V DC<br>40 mA typical at 12 V DC<br>80 mA max. |
| | Measuring rate | 1 kHz (asynchronous) |
| | Stability (temperature) | ±50 x $10^{-6}$/°C f.s. (typical) |
| | Repeatability | 1 LSB |
| | Operating temperature | See specification of the respective sensor |
| | Protection | Reverse polarity, short circuit |
| | Dielectric strength | 1 kV (V AC, 50 Hz, 1 min.) |
| | EMV | DIN EN 61326-1:2013 |

| **Signal wiring Connector M12, 5 pin** | **Output signals** | **Connector pin no.** | **Cable color** |
|---|---|---|---|
| | Shield | 1 | brown |
| | Excitation + | 2 | white |
| | GND | 3 | blue |
| | CAN-H | 4 | black |

| | | | |
|---|---|---|---|
|  View to the sensor connector | CAN-L | 5 | grey |

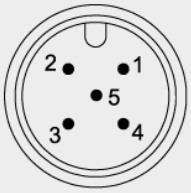
| | | | |
|---|---|---|---|
| **CANJ1939R**<br>CAN SAE J1939 | CAN Specification | ISO 11898, Basic and Full CAN 2.0 B | |
| | Transceiver | 24V-compliant, not isolated | |
| | Communication profile | SAE J1939 | |
| | Baud Rate | 250 kbit/s | |
| | Internal termination resistor | Adjustable by the customer | |
| | Address | Default 247d and 246d, configurable | |

| | | | |
|---|---|---|---|
| **NAME Fields** | Arbitrary address capable | 1 | Yes |
| | Industry group | 0 | Global |
| | Vehicle system | 7Fh (127d) | Non specific |
| | Vehicle system instance | 0 | |
| | Function | FFh (255d) | Non specific |
| | Function instance | 0 | |
| | ECU instance | 0 | |
| | Manufacturer | 145h (325d) | Manufacturer ID |
| | Identity number | 0nnn | Serial number 21 bit |

| | | | |
|---|---|---|---|
| **Parameter Group Numbers (PGN)** | Configuration data | PGN EF00h | Proprietary-A<br>(PDU1 peer-to-peer) |
| | Process data | PGN FFnnh | Proprietary-B<br>(PDU2 broadcast);<br>nn Group Extension (PS) configurable |

| | | |
|---|---|---|
| **Specifications** | Excitation voltage | 8 ... 36 V DC |
| | Excitation current | 40 mA typical at 24 V DC<br>80 mA typical at 12 V DC<br>120 mA max. |
| | Measuring rate | 1 kHz (asynchronous) |
| | Stability (temperature) | ±50 x $10^{-6}$/°C f.s. (typical) |
| | Repeatability | 1 LSB |
| | Operating temperature | See specification of the respective sensor |
| | Protection | Reverse polarity, short circuit |
| | Dielectric strength | 1 kV (V AC, 50 Hz, 1 min.) |
| | EMV | DIN EN 61326-1:2013 |

| **Signal wiring Connector M12, 5 pin** | **Output signals** | **Connector pin no.** | **Cable color** |
|---|---|---|---|
| | Shield | 1 | brown |
| | Excitation + | 2 | white |
| | GND | 3 | blue |
| | CAN-H | 4 | black |
| | CAN-L | 5 | grey |




View to the sensor connector

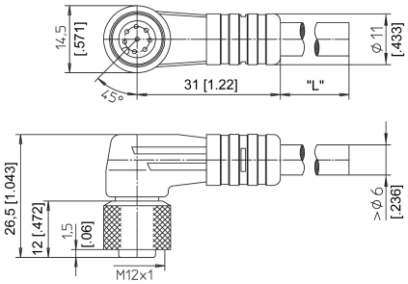
## Accessories
## Connector cable M12, 8 pin
### (angular coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin 90° M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.

Wire: cross sectional area 0.25 mm²

Cable diameter: 6.3 ±0.2 mm




**Order code**

| | |
|---|---|
| | **KAB - xM - M12/8F/W - LITZE** |
| IP69: | **KAB - xM - M12/8F/W/69K - LITZE** |

xM = length in m

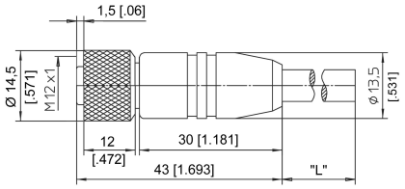
## Connector cable M12, 8 pin
### (straight coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.

Wire: cross sectional area 0.25 mm²

Cable diameter: 6.3 ±0.2 mm




**Order code**

| | |
|---|---|
| | **KAB - xM - M12/8F/G - LITZE** |
| IP69: | **KAB - xM - M12/8F/G/69K - LITZE** |

xM = length in m

| **Signal wiring** M12, 8 pin | **Plug connection / cable color** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | white | brown | green | yellow | grey | pink | blue | red |

### Applicable for cable carriers

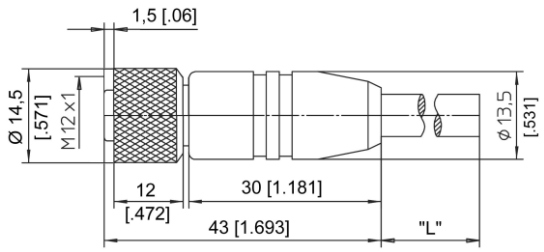
| | |
|---|---|
| Maximum movement speed | 3 m/s |
| Maximum acceleration | 5 m/s² |
| Minimum bending radius | 10 x cable diameter |

## Connector/bus cable M12, 5 pin CAN-Bus

The 5-lead shielded cable is supplied with a female 5 pin M12 connector at one end and a male 5 pin M12 connector at the other end.

Available lengths are 0.3 m, 2 m, 5 and 10 m.

Cable diameter: 6.7 ±0.2 mm




**Order code**

| | |
|---|---|
| | **KAB - xM - M12/5F/G - M12/5M/G - CAN** |
| IP69: | **KAB - xM - M12/5F/G/69K - M12/5M/G/69K - CAN** |

xM = length in m

### Applicable for cable carriers

| | |
|---|---|
| Maximum movement speed | 3 m/s |
| Maximum acceleration | 5 m/s$^2$ |
| Minimum bending radius | 10 x cable diameter |

## T-connector for bus cable M12, 5 pin CAN-Bus

**Order code**

**KAB - TCONN - M12/5M - 2M12/5F - CAN**



## Terminating resistor M12, 5 pin CAN-Bus

**Order code**

**KAB - RTERM - M12/5M/G - CAN**

